

A MONOGRAPHIC STUDY OF THE GENUS *PALAFOXIA* AND ITS IMMEDIATE ALLIES¹

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INTRODUCTION

It has been the purpose of this study to evaluate taxonomically on the basis of morphological examination the generic and specific entities involved in *Palafoxia* and its immediate allies, southern United States and Mexican representatives of the tribe Helenieae in the Compositae. Early in the history of the group considered, it was recognized that more than one generic element was present in this complex of related plants, but the exact nature and scope of these units were not known. There have been many different interpretations of the generic relationships and considerable shifting of the species from one genus to another without satisfactory results.

From the present study it is concluded that there are three distinct genera in the group, namely, *Othake*, *Polypteris*, and *Palafoxia*, and that in the last genus two elements are enough different to substantiate division into two subgenera.

The second part of this problem has been to determine the generic relationships of the species involved and to examine their validity. In *Othake* delimitation of the species has been unsatisfactory because of the great variability of the plants; certain species have been based on specimens which more thorough collecting proves to be extreme forms scarcely equal in rank to the recognized entities. It has therefore seemed advisable to reduce two species to varietal rank and to place another in synonymy. A somewhat similar situation in *Palafoxia* warrants the reduction of a species to a variety.

Morphological examination was based on herbarium material in the Missouri Botanical Garden and on living material observed and collected in Texas by the writer. Type specimens and additional material were obtained from the Gray Herbarium, the Academy of Natural Sciences of Philadelphia, the New York Botanical Garden Herbarium, and the S. M. Tracy Herbarium of A. and M. College, College Station, Texas.

It is with sincere appreciation that the kindness and assistance of Dr. Jesse M. Greenman is acknowledged. To Dr. George T. Moore, for the facilities of the library and the herbarium, and to Mr. H. B. Parks, for many specimens from Texas, thanks are also expressed.

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TAXONOMIC HISTORY

Since it would be impossible to relate the history of any one of these three genera without continually referring to that of the other two, it seems best to present as a single unit the changing historical positions and inter-relationships of the genera concerned.

Palafoxia, named for the Spanish general, José Palafox, was the first genus of this complex to be described. In 1816 Lagasca¹ gave this name to a plant from "New Spain," which was grown in the Royal Gardens at Madrid and which Cavanilles had at first called *Ageratum lineare*² and afterwards transferred to *Stevia*³. Later in the year 1816 Cassini published the genus *Paleolaria*⁴, based on Lagasca's plant, but did not actually describe the type species until 1818. At that time he placed *Palafoxia linearis* in synonymy under his *Paleolaria carnea*⁵, which, along with the generic name, cannot be retained because of the priority of the earlier name.

With the publication of the genus *Polypteris*⁶ together with its Floridian type species, *P. integrifolia*, by Nuttall in 1818, an element closely related to the first-mentioned plant was introduced. The similarity caused Lessing⁷ in his 'Synopsis Generum Compositarum' to include both genera under *Paleolaria*, which he recognized in preference to *Palafoxia*. Regarding the species, he says, "*Paleolaria carnea* Cass. = *Palafoxia linearis* Lag." and "*Paleolaria fastigiata* Less. = *Polypteris integrifolia* Nutt."

The next allied plant recorded in the literature was from Arkansas and was described by Nuttall as *Stevia callosa*⁸ in 1821. DeCandolle⁹, in his 'Prodromus' (1836), transferred this species to *Florestina* and included under the genus *Palafoxia*: *P. linearis*, *Polypteris integrifolia* as *Palafoxia fastigiata*, in addition to two new species. Under the name *Polypteris integrifolia* Nutt. he placed a plant with entirely different generic affinities.

In 1836 also Rafinesque¹⁰ based a new genus on Nuttall's *Stevia callosa* and named the entity *Othake*, separating it from existing genera chiefly on the nature of the involucre bracts and the "deep-cut florets." This name was not employed till later, however, for the species involved were for some time referred to *Palafoxia*, *Polypteris*, or distributed between the two genera.

¹ Lag. Elench. Pl. Hort. Matr. 26. 1816.

² Cav. Ic. 3:3, t. 205. 1794.

³ Cav. Praelect. n. 464, and Ic. 4:32. 1797.

⁴ Cass. in Bull. Soc. Phil. 198. 1816.

⁵ Cass. in Bull. Soc. Phil. 47. 1818.

⁶ Nutt. Gen. N. Am. Pl. 2:139. 1818.

⁷ Less. Syn. Comp. 155. 1832.

⁸ Nutt. in Jour. Acad. Nat. Sci. Phila. I. 2:121. 1821.

⁹ DC. Prodr. 5:124, 655, 659. 1836.

¹⁰ Raf. New Fl. Am. 4:73. 1836.

Torrey and Gray¹¹, in 1842, united the scattered, related elements under three sections of the single genus *Palafoxia*: 1. *Eupalafoxia*, 2. *Florestinaria*, and 3. *Polypteris*. Benth and Hooker¹², in 1873, followed the same interpretation and located *Palafoxia* in the subtribe Baerieae of the tribe Helenioideae.

In 1883 Dr. Gray¹³ maintained that the separation of *Palafoxia* and *Polypteris* was substantiated by the nature of the involucre bracts and the corolla characters. Nuttall's *Stevia callosa*, with its immediate allies, and *P. integrifolia* were referred to the genus *Polypteris*; *Palafoxia linearis* and the anomalous Floridian species, *P. Feayi*, were retained in *Palafoxia* and included in the Helenieae of the Helenioideae. Hoffmann's¹⁴ treatment of the Compositae (1891) reunited all of the entities under *Palafoxia*.

The first monographic study of the Texas and southwestern representatives of the complex was made in 1904 by Bush¹⁵. He recognized Rafinesque's name, *Othake*, for the greater number of the species in the *Polypteris* group of Gray and applied the latter name to the original type-species only, *P. integrifolia*. The most complete monographic investigation has been that of Rydberg¹⁶, who recognized three genera, *Polypteris*, *Othake*, and *Palafoxia*, and placed them in a separate subtribe, Palafoxianae.

GENERAL MORPHOLOGY

Roots.—In *Polypteris* the numerous, slender, fibrous roots develop from a short, stout woody base of perennial duration. *Othake* and *Palafoxia* have annual taproots which may become woody and perennial under conditions favoring continued growth.

Stems.—In these three genera the stems are herbaceous throughout or suffrutescent, but never entirely ligneous. The stems of *Polypteris* are either simple or sparingly branched below the inflorescence; those of *Palafoxia* are extensively branched throughout; both of these conditions are represented by the species of *Othake*. In the nature of the pubescence and the glandular element the genera differ. In *Polypteris* the stem is strigillose and eglandular, while the stems of *Othake* and *Palafoxia*, with a few exceptions, are strigose-hirtellous or strigose-hirsute and densely glandular above.

Leaves.—The leaves in the three genera are quite similar, being alternate or the lower ones opposite, and usually narrowed at the base into a short petiole; they vary in shape from linear to ovate-lanceolate and are entire. Three nerves are usually visible, or the two fainter lateral ones may be indistinct because of the dense pubescence. A small, yellowish callosity is found at the apex.

¹¹ Torr. & Gray, Fl. N. Am. 2:368. 1842.

¹² Benth. & Hook. Gen. Pl. 2:405. 1873.

¹³ Gray in Proc. Am. Acad. 19:30. 1883.

¹⁴ Hoffm. in Engl. & Prantl, Die Nat. Pflanzenfam. IV, Abt. 5, p. 261. 1891.

¹⁵ Bush in Trans. Acad. Sci. St. Louis 14:173. 1904.

¹⁶ Rydb. in N. Am. Fl. 34¹:58. 1914.

Pubescence.—The hairs on the vegetative parts of these plants are multicellular, tuberculate, and usually coarse. *Othake* is characterized by a strigose-hirtellous type of indument, which is found on the stems, leaves, and involucre. The peculiar type of capitate, glandular hair found among the other hairs in *Othake* is best illustrated in *O. callosum*, where the large, mushroom-shaped structures with purplish glandular caps are conspicuous. The hair bases and adjacent cells are usually distended and somewhat glandular. In *Palafoxia* the pubescence is similar but more hispid, and the glandular hairs have larger bases and smaller glandular tips. *Polypteris* is strigillose and eglandular.

Inflorescence.—In *Polypteris* there is a single corymbiform cluster of many discoid heads terminating the stem. In *Palafoxia* cymose or corymbiform clusters of a few discoid heads are borne at the ends of the branches. In *Othake* both of these conditions occur, and the heads are either discoid or radiate.

Involucre.—The involucre bracts are 2–3-seriate, but in other characteristics they are strikingly different in the three genera. In *Polypteris* the bracts are papery and membranaceous; they are flat, obtuse to truncate, almost glabrous, and several of the shorter outer bracts are reflexed. The bracts of *Othake* are herbaceous, densely pubescent, often glandular, with an irregular, dry, reddish tip, and at times show a tendency to embrace the marginal achenes at maturity. In the typical *Palafoxia* the involucre is entirely herbaceous and glandular-pubescent, the bracts being acute, subequal, keeled, and closely clasping the mature marginal achenes. In the last two genera the innermost bracts are often narrowed, thin, and hyaline-margined. The involucre of *Othake* and *Polypteris* are turbinate, while those of *Palafoxia* are oblong-conic.

Receptacle.—A small, flat, naked and pitted receptacle with irregular aggregations of tissue around the base of the achenes is characteristic of all three genera.

Corollas.—The nature of the corolla separates *Othake* and *Polypteris* from *Palafoxia*. In *Palafoxia* the floret has a long, cylindraceous throat which exceeds the 5 short lobes and tube. *Polypteris* and *Othake* have florets with 5 long, spreading lobes, a filiform tube, and a short campanulate throat, which in *Othake* is often indistinguishable. The lobes in all the genera are usually thickened at the tip, puberulent without, and minutely papillose on the inner surface of the entire lobe. The tube is glabrous, puberulent, or glandular-puberulent, and dilated at the base. The ray florets of the heterogamous species of *Othake* are pistillate, fertile, and have deeply 3-lobed ligules. The style branches are revolute or spreading, papillose to hispidulous on the outer surface, and with 2 stigmatic lines on the inner faces. In color the florets vary from flesh to rose.

Achenes.—The achenes of *Polypteris* are 4–5-angled with unequal faces. Those of *Othake* and *Palafoxia* are square in cross-section. In *Polypteris* and *Othake*, the achenes are obpyramidal and often arcuate because of the pressure of adjacent achenes; in *Palafoxia* they are linear or somewhat obpyramidal and straight. Only one species in the group has glabrous achenes, *O. Lindenii*; in the

others, the degree of pubescence varies from hirsute to puberulent.

Pappus.—The pappus-scales vary greatly in the three genera and exhibit both generic and specific differences, but the same general type of scale is present throughout, namely, a callose midrib, broad at the base and narrowed upward, with scarious, hyaline margins. In *Polypteris* and *Othake* the midrib is slender and does not exceed the throat in length, while in *Palafoxia* it is stiff and broad and almost the length of the corolla. In *Othake* the length and shape of the scale and the nature of the apex assist in differentiating the species; also, in certain species with homogamous heads, the pappus-scales of the marginal florets are often reduced, as they are consistently in the ray florets of the heterogamous heads.

GEOGRAPHICAL DISTRIBUTION

The representatives of this group are found chiefly in Florida and the southwestern United States. *Polypteris* is limited in its distribution to Florida and southern Georgia. Species of *Othake* have their center of distribution in Texas but extend northeast to Missouri, south to Mexico, and northwest to Colorado. *Palafoxia* is represented in Florida by one species, and the remainder of the genus occurs in southwestern United States and Mexico.

ABBREVIATIONS

The herbaria from which specimens have been cited are indicated by the following abbreviations: Missouri Botanical Garden (MBG); Herbarium of the Academy of Natural Sciences, Philadelphia (ANSP); Gray Herbarium of Harvard University (G); Herbarium of the New York Botanical Garden (NYB); S. M. Tracy Herbarium of the A. and M. College, College Station, Texas (SMT).

TAXONOMY

KEY TO THE GENERA

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|---|------------|
| A. Heads radiate or discoid; lobes and tube of the corolla much longer than the throat. | |
| B. Involucral bracts herbaceous with membranaceous, reddish tips..... | OTHAKE |
| BB. Involucral bracts membranaceous and papery, sub-stramineous..... | POLYPTERIS |
| AA. Heads discoid; lobes and tube of the corolla much shorter than the throat..... | PALAFOXIA |

OTHAKE

Othake Raf. New Fl. Am. 4:73. 1836; Bush in Trans. Acad. Sci. St. Louis 14:173. 1904; Wooton & Standley in Contrib. U. S. Nat. Herb. 19:722. 1915; Rydb. in N. Am. Fl. 34¹:58. 1914, Fl. Rocky Mts. & Adj. Plains, 944. 1917, and Fl. Prairies & Plains Cent. N. Am. 854. 1932.

Stevia Nutt. in Jour. Acad. Nat. Sci. Phila. 2:121. 1821, not *Stevia* Cav. Ic. 4:32, t. 342-356. 1797.

Palafoxia DC. Prodr. 5:124. 1836, in part, not *Palafoxia* Lag. Gen. et Sp. Nov. 26. 1816; Torr. & Gray, Fl. N. Am. 2:368. 1842, in part; Benth. & Hook.

Gen. Pl. 2:405. 1873, in part; Hoffm. in Engl. & Prantl, Die Nat. Pflanzenfam. IV, Abt. 5, p. 261. 1891.

Florestina DC. Prodr. 5:655. 1836, in part, not *Florestina* Cass. in Bull. Soc. Phil. 175. 1815.

Polypteris Gray in Proc. Am. Acad. 19:30. 1883, in part, and Syn. Fl. N. Am. 1²:74, 337. 1884, and ed. 2. 1886, in part; Chapman, Fl. South. U. S., ed. 3, 261. 1897, in part; Small, Fl. Southeast. U. S., 1287. 1903, and ed. 2, 1913, in part; Gray, Manual, ed. 7, 843. 1908.

Herbaceous, caulescent annuals, occasionally woody at the base and perennial. Stem usually solitary from a stout tap-root, branched, strigose, usually glandular above. Leaves alternate or the lower opposite, entire, thick, 1-3-nerved. Heads discoid or radiate in corymbiform clusters terminating the branches. Involucre turbinate, the bracts in 2-3 series, subequal, the somewhat shorter outer bracts not reflexed, herbaceous and green with a sphacelate, reddish tip, and tending occasionally to enfold the marginal achenes. Receptacle flat, naked, and pitted. Corollas reddish-pink, those of the disc-florets perfect, regular, deeply 5-lobed, the lobes and filiform tube at least twice as long as the short, campanulate throat. Ray-florets, when present, in one cycle, pistillate and fertile, deeply 3-lobed. Stamen-tube completely exerted, the anthers obtuse at the base. Style-branches linear, spreading or revolute, hispidulous. Achenes 4-angled, obpyramidal. Pappus of 7-10 scales, varying from a minute callosity to a long, acuminate, hyaline-margined callose midrib exceeding the corolla-tube, the squamallae of the ray-florets of the radiate heads and often of the marginal florets of the discoid heads reduced.

Type species: *Othake tenuifolium* Raf. New Fl. Am. 4:73. 1836 (= *Othake callosum* (Nutt.) Bush).

KEY TO THE SPECIES

- A. Heads discoid.
 - B. Pappus-scales 0.5-3.0 mm. long, exceeded by the achenes, the scales of the marginal achenes not reduced in size.
 - C. Pappus-scales less than 1.5 mm. long, obtuse; florets 7-12 in a head; leaves 1-2 mm. wide..... 1. *O. CALLOSUM*
 - CC. Pappus-scales 2-3 mm. long, acute or obtuse; florets 12 or more in a head; leaves more than 3 mm. wide.
 - D. Plants slender, florets 12-20 in a head; leaves 3-5 mm. wide ... 2. *O. ROSEUM*
 - DD. Plants stout, florets about 25, occasionally more, leaves 0.7-1.5 cm. wide..... 2a. *O. ROSEUM* var. *ROBUSTUM*
- BB. Pappus-scales 3.5-8.0 mm. long, equalling or exceeding the achenes, rarely shorter, the scales of the marginal achenes often reduced in size.
 - E. Achenes distinctly pubescent.
 - F. Pappus-scales acute, 3.5-4.5 mm. long, peduncles sparingly glandular-pubescent..... 3. *O. TEXANUM*
 - FF. Pappus-scales acuminate, 6-8 mm. long, peduncles distinctly glandular-pubescent..... 3a. *O. TEXANUM* var. *MACROLEPIS*
 - EE. Achenes glabrous, or nearly so..... 4. *O. LINDENII*

AA. Heads radiate.

- G. Plants slender; leaves linear, 2–6 mm. wide, florets 9–12 in a head..... 5. *O. REVERCHONII*
 GG. Plants stout, leaves lanceolate, 0.5–1.5 cm. wide, florets 20–70 in a head.
 H. Stem branched, florets 20–30, glandular-pubescent on the peduncles only..... 6. *O. SPHACELATUM*
 HH. Stem simple, florets 60–70, the entire plant usually glandular-pubescent and somewhat viscid..... 7. *O. HOOKERIANUM*

1. *Othake callosum* (Nutt.) Bush in Trans. Acad. Sci. St. Louis **14**:174. 1904; Britt. & Brown, Illust. Fl. **3**:507, fig. 4535. 1913; Rydb. in N. Am. Fl. **34**¹:59. 1914.

Othake tenuifolium Raf. New Fl. Am. **4**:74. 1836.

Stevia callosa Nutt. in Jour. Acad. Nat. Sci. Phila. I. **2**:121. 1821, and in Linnaea **4**:40. 1829; Barton, Fl. N. Am. **2**:31, t. 46. 1822.

Florestina callosa DC. Prodr. **5**:655. 1836.

Palafoxia callosa (Nutt.) Torr. & Gray, Fl. N. Am. **2**:369. 1842; Walp. Rep. Bot. Syst. Suppl. **1**:949. 1843.

Polypteris callosa (Nutt.) Gray in Proc. Am. Acad. **19**:30. 1883, and Syn. Fl. N. Am. **1**²:337. 1884, and ed. 2. 1886; Coulter in Contrib. U. S. Nat. Herb. **2**:230. 1892.

A slender, herbaceous annual; stem 1–5 dm. high, somewhat geniculate, terete, canescent-strigose, finely furrowed, somewhat shining below; leaves sessile or nearly so, linear to lanceolate-linear, 3–5 cm. long, 1–2 mm. broad, obtuse, narrowed at the base, strigose and hispidulous on both surfaces, 1(–3)-nerved; peduncles slender, minutely strigose, densely glandular-pubescent with large purple-tipped hairs; heads numerous, about 1 cm. high; involucre bracts 7–9, linear to oblong-lanceolate, about 5 mm. long, acute to acuminate, slightly fimbriate at the apex, strigose, eglandular or with a few capitate-glandular hairs; florets 7–12 in a head; corolla-lobes linear, 3.5 mm. long, obtuse to acutish, the tips pubescent without; throat campanulate, very short, about 0.5 mm. long, glabrous; tube slender, somewhat expanded at the base, 2.0–2.5 mm. long, pubescent, sparingly glandular; achenes 3–4 mm. long, puberulent; pappus-scales 8–9, subequal, varying from a minute, blunt, callose midrib to a broadly ovate scale 1 mm. or less long, with an erose hyaline margin and a glabrous included rib.

Distribution: southern Missouri to Texas.

MISSOURI: Greene Co., Sept. 4, 1893, *Bush* 203 (MBG); Eagle Rock, Barry Co., Sept. 17, 1896, *Bush* 115 (MBG); barrens, Swan, Sept. 24, 1899, *Bush* 476, and Sept. 22, 1905, 3354 (MBG); barrens, Eagle Rock, Aug. 9, 1905, *Bush* 3187 (MBG); gravelly bars, Noel, Aug. 7, 1908, *Bush* 4983 (MBG); barrens, Barry Co., July 16, 1935, *Bush* 14999 (MBG); dry ground, Baxter, Sept. 10, 1935, *Bush* 15180 (MBG); gravelly places, Barry Co., Sept. 10, 1935, *Bush* 15190 (MBG); rocky banks, Stone Co., Sept. 11, 1935, *Bush* 15195 (MBG); bottoms, Barry Co., Sept. 22, 1936, *Bush* 15756 (MBG); common in barrens, Eagle Rock, Barry Co., Sept. 17, 1898, *Mackenzie* (MBG); gravelly bars, Noel, Aug. 7, 1908, *Palmer* 4893, Sept. 2, 1913, 4078, and Sept. 11, 1920, 19067 (MBG); rocky ledges, barrens, Galena, Stone Co., Oct. 11, 1913, *Palmer* 4633 (MBG); rocky

terraces of "bald knobs," Roark, Stone Co., Sept. 28, 1920, *Palmer 19204* (MBG); sandstone glades, top of bluff along river, near Tecumseh, Ozark Co., Oct. 8, 1927, *Palmer 33012* (MBG); Wilson Creek, Green Co., *Shepard* (MBG); upland open places bordering limestone glade, 2 mi. w. of Richville, Douglas Co., Aug. 19, 1934, *Steyermark 14657* (MBG).

ARKANSAS: barrens, Benton Co., Sept. 9, 1936, *Bush 15752* (MBG); barrens, Oakgrove, Oct. 7, 1936, *Bush 15942* (MBG); along railroad track, Gilbert, Searcy Co., Aug. 5, 1913, *Emig 43* (MBG); without definite locality, *Nuttall* (ANSP), TYPE; Red River, *Nuttall* (ANSP); barrens, rocky hillsides, Beaver, Carroll Co., Sept. 26, 1913, *Palmer 4492* (MBG); Eureka Springs, Aug. 1887, *Wislizenus* (MBG).

OKLAHOMA: roadside clay soil, 6 mi. s. of Elk City, Beckham Co., Oct. 17, 1936, *Eskeu 1502* (MBG).

TEXAS: rocky soil, s. of San Antonio, Bexar Co., June 25, 1938, *Ammerman 8*, and rocky soil near Kerrville, June 30, 1938, *39* (MBG); Dallas, common on hills, Sept. 26, 1900, *Bush 1146*, and common in barrens, Oct. 30, 1900, *1635* (MBG); 1.5 mi. n. of Leona, Leon Co., Oct. 5, 1937, *Cory 25366* (MBG); dry hills in Jacksonville, Cherokee Co., Aug. 29, 1898, *Eggert* (MBG); between Sheffield and Pecos River, Pecos Co., July 23, 1921, *Ferris & Duncan 2915* (MBG); sandy woods and fields, Dallas, June 20, 1872, *Hall 356* (MBG); Willow Creek, Gillespie Co., *ex Herb. Jermy 804* (MBG); Denison, July 22-25, 1880, *Letterman* (MBG); Comanche Spring, Nov. 1849, *Lindheimer 956*, and New Braunfels, 1851, *955* (ANSP, MBG); dry, calcareous soil, Comanche Peak near Granbury, Hood Co., Sept. 15, 1914, *Palmer 6443a* (MBG); rocky open ground, Kerrville, Kerr Co., Oct. 5, 1916, *Palmer 10898* (MBG); gravel bars of river, Blanco, Blanco Co., Sept. 24, 1917, *Palmer 12856* (MBG); dry, calcareous open ground, near Brownwood, Brown Co., Nov. 1, 1925, *Palmer 29531* (MBG); Bexar Co., Sept. 8, 1938, *Parks* (MBG); 1.5 mi. w. of Mountain Home, Kerr Co., Oct. 1, 1936, *Parks & Cory 20747 & 20748* (SMT); dry ground, Dallas, Oct. 1, 1902, *Reverchon* (MBG); dry uplands, Oak Cliff, Oct. 16, 1902, *Reverchon 3288* (MBG); limestone prairies, Dallas, Oct. 16, 1902, *Reverchon* (MBG); on rocks, Comanche Peak, Sept. 1903, *Reverchon 3655* (MBG); Weatherford, Oct. 18, 1902, *Tracy 8142* (MBG).

2. *Othake roseum* Bush in Trans. Acad. Sci. St. Louis **14**:175. 1904; Rydb. in N. Am. Fl. **34**¹:59. 1914.

Polypteris rosea (Bush) Small, Fl. Southeast. U. S., ed. 2, 1372. 1913.

A slender, herbaceous annual; stem 3-6 dm. high with a few ascending branches, terete, strigose, somewhat scabrous, finely furrowed, cinereous; leaves petiolate, linear-lanceolate, 4-6 cm. long, 3-5 mm. broad, obtuse, narrowed at the base, scabrous on both surfaces, 1(-3)-nerved; peduncles slender, long, finely glandular; involucre bracts 7-10, oblanceolate, 6-8 mm. long, acute to obtuse, strigose, eglandular; florets 12-20 in a head; corolla-lobes linear, 4 mm. long, the tips pubescent without; throat campanulate, very short, about 0.5 mm. long, glabrous; tube slender, dilated at the base, 4 mm. long, minutely glandular-puberulent; achenes 3-4 mm. long, pubescent; pappus-scales about 8, ovate-lanceolate, about 2 mm. long, acute or obtuse, the midrib dorsally pubescent, the hyaline margins erose, scales of the marginal achenes scarcely reduced.

Distribution: Texas.

TEXAS: about 2 mi. s. of College Station, Brazos Co., June 22, 1938, *Ammerman 7* (MBG); Houston, Oct. 25, 1900, *Bush 1599* (MBG); sandy ground near Dallas, June 24, 1899, *Eggert* (MBG); along Devils River, Valverde Co., Sept. 10, 1900, *Eggert* (MBG); Dallas, June 16, 1898, *Glatfelter* (MBG); Galveston Bay, Sept. 26, 1884, *Joor* (MBG);

banks of Buffalo Bayou, near Houston, Oct. 1841, *Lindheimer* (MBG); wet prairies, Houston, Aug. 1842, *Lindheimer* (MBG); dry open ground, Houston, Harris Co., Sept. 16, 1915, *Palmer* 8575 (MBG); prairies, Bryan, Brazos Co., Sept. 17, 1916, *Palmer* 10732 (ANSP, MBG); College Station, Brazos Co., July, 1888, *Pammel* (MBG); Newland, near Dallas, June 6, 1901, *Reverchon* 2577, and sands, Dallas, May 1, 1902, 3290 (MBG); Buzzards Spring, Aug. 7, 1902, *Reverchon* 3290 (MBG); Sheldon, Sept. 20, 1903, *Reverchon* 3656, and Oct. 7, 1903, 3656 TYPE (MBG); Millett, Nov. 4, 1897, *Trelease* (MBG); Willis, Aug.-Sept., *Warner* (MBG).

2a. *Othake roseum* var. *robustum* (Rydb.) Ammerman, comb. nov.

O. robustum Rydb. in N. Am. Fl. 34¹:60. 1914.

Polypteris robustum (Rydb.) Cory in *Rhodora* 38:408. 1936.

Stem 3–7 dm. high, stout, often ligneous below; leaves lanceolate to ovate-lanceolate, 4–8 cm. long, 0.7–1.5 cm. wide, indistinctly 3-nerved; peduncles glandular; florets about 25, occasionally more, in a head; as the species in other characters.

Distribution: southern Texas, south to Tamaulipas, Mexico.

TEXAS: Corpus Christi Bay, Nueces Co., *Heller* 1562 (MBG); Highway 35, Aransas Co., Highway 181, Bee Co., and Highway 181, Bexar Co., Sept. 9, 1938, *Parks* (MBG); Karnes Co. and Refugio Co., Sept. 9, 1938, *Parks* (MBG); Highway 181, San Patricio Co., and Highway 77, Victoria Co., Sept. 9, 1938, *Parks* (MBG); Wilson Co., Sept. 8, 1938, *Parks* (MBG); 12 mi. s. e. of Hebbronville, Jim Hogg Co., Oct. 7, 1935, *Parks* & *Cory*, 16941 & 16942 (SMT); seashore at Rockport, July, 1893, *Reverchon* 1230 (MBG); Brownsville, Aug. 1, 1923, *Runyon* 209 (MBG).

MEXICO:

TAMAULIPAS: dunes, Tampico, Nov. 24, 1937, *Kenoyer* 728 (MBG); vicinity of Tampico, Jan. 1–31, 1910, *Palmer* 38 (MBG); sand-dunes of Gulf coast, Tampico, July 4, 1896, *Pringle* 6354 (MBG), CO-TYPE.

3. *Othake texanum* (DC.) Bush, Trans. Acad. Sci. St. Louis 14:176. 1904; Rydb. in N. Am. Fl. 34¹:59. 1914; Wooton & Standley, Contrib. U. S. Nat. Herb. 19:722. 1915.

O. canescens Rydb. in N. Am. Fl. 34¹:60. 1914.

Palafoxia Texana DC. Prodr. 5:125. 1836, not Hook. Ic. Pl. t. 148. 1837; Dietrich, Syn. Pl. 1345. 1847; Torr. & Gray, Fl. N. Am. 2:369. 1842; Hemsl. Biol. Cent.-Am. Bot. 4:59. 1886.

Polypteris Texana (DC.) Gray in Proc. Am. Acad. 19:30. 1883, and Syn. Fl. N. Am. 1²:337. 1884, and ed. 2. 1886; Small, Fl. Southeast. U. S., 1287. ed. 1. 1903, and ed. 2. 1913.

An herbaceous, rather stout annual, occasionally woody below and perennial; stem 3–5 dm. high, much-branched, terete, strigose, shallowly furrowed; leaves petiolate, linear-lanceolate to ovate-lanceolate, 3–5 cm. long, 0.3–1.0 cm. broad, obtuse, strigose on both surfaces, narrowed or somewhat rounded at the base, 3-nerved, petiole 4–6 mm. long; peduncles rather stout, strigose and somewhat glandular, but not densely so; heads numerous, 1.0–1.5 cm. high; involucre bracts 12–15, linear-lanceolate, acute to obtuse, about 9 mm. long, strigose, eglandular; florets 25–30 in a head; corolla-lobes linear, 3–4 mm. long, the tips pubescent without; throat short, campanulate, about 0.5 mm. long; tube slender,

dilated at the base, about 3 mm. long, finely glandular-pubescent; achenes 4.5–6.0 mm. long, pubescent; pappus-scales 6–8, obovate, 3.5–4.5 mm. long, acute, erose, the midrib dorsally pubescent, the pappus of the outer achenes shorter, 1.0–1.5 mm. long, and obtuse.

Distribution: Oklahoma, Texas, and northern Mexico.

OKLAHOMA: Johnson's Pasture, McClain Co., June 26, 1937, *Barkley 1499* (MBG); vicinity of Fort Sill, July 14, 1916, *Clemens 11844* (MBG).

TEXAS: south of San Antonio, Bexar Co., June 18, 1938, *Ammerman 97* (MBG); from Laredo to Bexar, *Berlandier 604, 2014* CO-TYPE (MBG); in low area, 1 mi. e. of Cotulla, LaSalle Co., July 30, 1921, *Ferris & Duncan 3014* (MBG); escarpment of Staked Plains on Quitaque-Plainview Rd., Floyd Co., Aug. 23, 1921, *Ferris & Duncan 3375* (MBG); Spofford, May 8–9, 1904, *Griffiths 6320* (MBG); Del Rio, April 21, 1930, *Jones 26398*, Carriso Spring, April 26, 1900, *28008*, and Laredo, March 24, 1932, *29467* (MBG); sandy bluffs near Laredo, Aug., 1899, *Mackenzie 7* (MBG); Laredo, Feb. & March, *Orcutt 5548* (MBG); sandy, open ground, Pleasanton, Atascosa Co., Sept. 23, 1916, *Palmer 10782* (MBG); Sutherland Springs, Wilson Co., July 10, 1938, *Parks & Ammerman 62* (MBG); Del Rio, Val Verde Co., April 18, 1935, *Parks & Cory 12290* (SMT); south-central Wilson Co., April 19, 1935, *Parks & Cory 12401*, and 11 mi. s. of Catarina, Dimmit Co., Oct. 7, 1935, *16946* (SMT); sandy plains, Laredo, July 24, 1889, *Pringle 2655* (MBG).

MEXICO:

NUEVO LEON: Sabinas Hidalgo, Sept. 16, 1936, *Kenoyer* (MBG); C. P. Diaz, April 18, 1900, *Trelease 66* (MBG).

COAHUILA: between Hipolito and Sacramento along a dry creek bed in El Desierto de la Payla, Ramos Arizpe, June 15, 1936, *Wynd & Mueller 83*, and San Lazaro, near n. entrance of El Puerto de San Lazaro, Castanos, June 16, 1936, *120* (MBG).

3a. *Othake texanum* var. *macrolepis* (Rydb.) Ammerman, comb. nov.

O. macrolepis Rydb. in Bull. Torr. Bot. Club. **37**:332. 1910, and in N. Am. Fl. **34**¹:60. 1914, Fl. Rocky Mts. & Adj. Plains, 944. 1917, and Fl. Prairies & Plains Cent. N. Am. 854. 1932.

Polypteris macrolepis (Rydb.) Cory in Rhodora **38**:408. 1936.

Stem herbaceous, 1.5–4.0 dm. high; leaves linear-lanceolate to lanceolate; peduncles glandular-pubescent; achenes about 6 mm. long, canescent-pubescent; pappus-scales about 8, ovate-lanceolate, 6–8 mm. long, attenuate-acuminate; in other characters as the species.

Distribution: Wyoming and Colorado.

WYOMING: sandy knoll, T. 38N., R. 67W., n. e. Converse Co., June 25, 1936, *Ownbey 1051* (MBG, NYB).

COLORADO: Rule Creek, Bent Co., Aug. 17, 1909, *Osterhout 4097* TYPE, and June 10, 1910, *4314* (NYB).

4. *Othake Lindenii* (Gray) Bush in Trans. Acad. Sci. St. Louis **14:173. 1904; Rydb. in N. Am. Fl. **34**¹:60. 1914.**

Palafoxia Lindenii Gray, Smiths. Contrib. to Knowledge (Pl. Wright. Pt. 1) **3**:120. 1852; Walp. Ann. Bot. Syst. **5**:161. 1858.

Polypteris Lindenii Gray in Proc. Am. Acad. **19**:30. 1883.

A simple or sparingly branched herbaceous annual; stem 4–7 dm. high, strigillose throughout, shallowly furrowed, gray-brown; leaves petiolate, oblong-

lanceolate to elliptic, 4–6 cm. long, 5–7 mm. broad, obtuse, narrowed at the base, puberulent on both surfaces, thick, obscurely 3-nerved, petioles 0.7–1.0 cm. long, expanded at the base; peduncles rather stout, long, densely glandular; heads few, about 1.7 cm. high; involucral bracts 11–15, linear to oblanceolate, about 9 mm. long, acute to obtuse, somewhat fimbriate at the apex, strigose, glandular; florets 18–25 in a head; corolla-lobes linear, 4 mm. long, acute to obtuse, somewhat pubescent at the tips; throat cylindric-campanulate, 1.5 mm. long, glabrous; tube slender, expanded at the base, 4.5 mm. long, not pubescent, finely glandular; achenes about 7 mm. long, glabrous or nearly so; pappus-scales 9–10, ovate-lanceolate, 4–6 mm. long, obtuse, the callose rib glabrous and extending to the tip of the scale, the hyaline margin erose near the apex.

Distribution: southern Mexico.

MEXICO:

VERA CRUZ: near the shore, n. of Vera Cruz, Jan. 24, 1906, *Greenman* 95 (G); Gulf Coast, Sept. 1912, *Purpus* 6025 (MBG, G); Antigua, June, 1838, *Linden*, fragments of TYPE, and Vera Cruz, sand-hills near the sea, 1840, *Galeotti* 2627 (G).

5. *Othake Reverchonii* Bush in Trans. Acad. Sci. St. Louis 14:180. 1904.

Polypteris Reverchonii (Bush) Small, Fl. Southeast. U. S., ed. 2, 1373. 1913.

A slender, herbaceous annual; stem 3–5 dm. high, simple below, with a few spreading branches above, terete, strigose, eglandular or minutely glandular in the upper parts, furrowed; leaves petiolate, linear to lanceolate-linear, 4–6 cm. long, 2–6 mm. broad, acute, narrowed at the base, slightly scabrous on both surfaces, 1-nerved, rarely 3-nerved, petioles 5–7 mm. long; peduncles long, slender, divaricate, strigose, eglandular or finely glandular; heads few, 1.0–1.4 cm. high; involucral bracts 7–9, oblanceolate, about 9 mm. long, acute or obtuse and somewhat fimbriate at the apex; ray-florets 4–6, the limb deeply 3-lobed, about 8 mm. long, the tube slender, densely glandular-pubescent, about 5 mm. long; disc-florets 5–6, the corolla-lobes 3 mm. long, linear; the cylindraceous, glabrous throat 2 mm. long; the tube 4 mm. long, slender, finely glandular-pubescent; achenes 5 mm. long, pubescent; pappus-scales 8, those of the ray-florets obovate, about 0.6 mm. long, obtuse, erose, those of the disc florets lanceolate, about 5 mm. long, lacerate-erose near the apex, the midrib dorsally pubescent.

Distribution: eastern Texas.

TEXAS: 2 mi. s. of Grapeland, Houston Co., Oct. 12, 1937, *Cory* 26155 (MBG); Cherokee, Oct. 31, 1884, *Joor* (MBG); dry sands, Big Sandy, Upshur Co., Sept. 27, 1926, *Palmer* 31756, and Sept. 16, 1902, *Reverchon* 3289 TYPE (MBG).

6. *Othake sphacelatum* (Nutt. ex Torr.) Rydb. in Bull. Torr. Bot. Club 37:331. 1910, and Fl. Rocky Mts. and Adj. Plains, 944. 1917; Britt. & Brown, Illust. Fl. 3:507, fig. 4534. 1913; Wooton & Standley in Contrib. U. S. Nat. Herb. 19:722. 1915.

Stevia sphacelata Nutt. ex Torr. in Ann. Lyc. N. Y. 2:214. 1828.¹⁷

¹⁷ A specimen of *O. callosum* in the Herbarium of the Academy of Natural Sciences of Philadelphia, bearing the label *Stevia sphacelata* in Nuttall's handwriting, indicates that Nuttall probably intended to give the latter name to his *S. callosa*. The confused history of the name *S. sphacelata* is set forth by Rydberg in the Bull. Torr. Bot. Club 37:331. 1910.

Palafoxia Hookeriana β . *subradiata* Torr. & Gray, Fl. N. Am. 2:368. 1842; Gray in Smiths. Contrib. to Knowledge (Pl. Wright., Pt. 1) 3:120. 1852.

Polypteris Hookeriana Gray in Proc. Am. Acad. 19:30. 1884, in part, and Syn. Fl. N. Am. 1²:337. 1884, and ed. 2, 1886, in part; Coulter in Contrib. U. S. Nat. Herb. 2:230. 1892, in part; Small, Fl. Southeast. U. S., 1287, ed. 1, 1903, and ed. 2, 1913; Coulter & Nelson, Man. Cent. Rocky Mts. 555. 1909.

Palafoxia Hookeriana Hooker in Curtis's Bot. Mag. 91:t. 5549. 1865, not Torr. & Gray, Fl. N. Am. 2:368. 1842.

O. Hookerianum (Torr. & Gray) Bush in Trans. Acad. Sci. St. Louis 14:177. 1904, excluding synonymy.

An herbaceous annual; stem 3–6 dm. high, somewhat geniculate, branched throughout with ascending branches, terete, strigose, shallowly furrowed; leaves petiolate, linear-lanceolate to lanceolate, 4–6 cm. long, 0.5–1.5 cm. wide, acute to obtuse, strigose on both surfaces, 3-nerved, petioles 0.6–1.0 cm. long; peduncles rather stout, densely glandular; heads few, 1.6–2.2 cm. high; involucral bracts 9–11, oblanceolate, about 1 cm. long, acute, strigose, glandular, the outer series often herbaceous throughout, the inner bracts with sphacelate, reddish tips; ray-florets 5–8, the limb 1.0–1.5 cm. long, deeply 3-cleft, the lobes rounded, the slender, glandular-pubescent tube 6 mm. long; disc-florets 15–20, the corolla-lobes linear, about 4 mm. long, the throat cylindraceous, 2 mm. long, glabrous, the tube filiform and dilated at the base, 8 mm. long, puberulent, eglandular; achenes 7–8 mm. long, pubescent; pappus-scales about 8, those of the ray-florets obovate, 1 mm. long or less, obtuse, erose, those of the disc-florets lanceolate, 8–9 mm. long, slightly exceeding the tube, attenuate, the midrib dorsally pubescent or glabrous.

Distribution: southwestern Kansas and Colorado southward to northern Mexico.

WITHOUT DEFINITE LOCALITY: *James* (NYB), TYPE.

KANSAS: Arkalon, Oct. 23, 1892, *Carleton* (NYB); sand hills, Hamilton Co., Aug. 3, 1895, *Hitchcock* 288 (MBG, NYB); Garden City, Aug. 14, 1896, *Letterman* (MBG); Arkalon, Aug. 17, 1890, *Smyth* 783 (MBG); Syracuse, Hamilton Co., July 4, 1893, *Thompson* 76 (NYB).

OKLAHOMA: Frederick, July 6, 1903, *Duncan* 29 (MBG); sand-dunes, s. e. Beckham Co., Oct. 18, 1936, *Eskew* 1524 (MBG); Red River bottoms, 10 mi. n. of Quanah, Texas, Aug. 21, 1921, *Ferris* & *Duncan* 3365 (NYB); sandy soil near roadside, 3 mi. n. of Alva, Woods Co., July 19, 1934, *Goodman* 2175, and banks of the North Fork of the Red River, near Sayre, Beckham Co., Sept. 12, 1934, 2354 (MBG); sand dunes along small tributary of North Canadian River, near Beaver, Beaver Co., July 24, 1933, *Palmer* 41895 (MBG); in sandy soil by Wolf Creek, near Shattuck, Ellis Co., Oct. 11, 1913, *Stevens* 2908 (MBG); sandy soil by river, 1 mi. n. of Sayre, Beckham Co., Aug. 8, 1927, *Stratton* 334, and 2 mi. n. of Beaver City, Beaver Co., Aug. 20, 1927, 411 (MBG); sand hills, Cimarron R., July 12, 1899, *White* 250 (MBG, NYB); Woodward Co., July 12, and July 13, 1900, *White* (MBG).

TEXAS: in sand desert on State Highway 51, near Crane, Crane Co., July 19, 1938, *Cutak* 6 (MBG); sandy ground near the Canadian River, Hemphill Co., Aug. 10, 1900, *Eggert* (MBG); grassy sand hills, 2 mi. s. of Muleshoe, Bailey Co., Aug. 24, 1921, *Ferris*

♂ *Duncan* 3411 (MBG, NYB); 1 mi. n. of bridge over Canadian R., Amarillo-Dalbart Rd., Oldham Co., Aug. 27, 1921, *Ferris* & *Duncan* 3501 (MBG); along railway, Amarillo, Potter Co., July 13, 1917, *Potter* 12543 (MBG); sandy open ground, along river, Canadian, Hemphill Co., June 17, 1918, *Palmer* 14100 (MBG); sands, Tascosa, June 24, 1902, *Reverchon* 3219 (MBG).

COLORADO: Fort Collins, Sept. 25, 1894, *Baker* (NYB); Fort Morgan, Sept. 4, 1918, *Hapeman* (MBG).

NEW MEXICO: 35 mi. w. of Roswell, Chaves Co., Aug., 1900, *Earle* & *Earle* 381 (MBG, NYB); sand plain n. of Magdalena, Datil Forest, Socorro Co., Oct. 2, 1919, *Eggleston* 16193 (MBG); sandy soil, Jemez Springs, Aug. 24, 1931, *Nelson* 11680 (MBG); Carlsbad, Oct. 3, 1902, *Tracy* 8163 (MBG); Mesilla, Dona Ana Co., June 17, 1897, *Wooton* 28 (MBG, NYB); Mesilla Valley, Dona Ana Co., Oct. 10, 1907, *Wooton* (MBG).

MEXICO:

CHIHUAHUA: sand hills near Paso del Norte, Sept. 20, 1886, *Pringle* 761 (MBG).

7. Othake Hookerianum (Torr. & Gray) Bush in Trans. Acad. Sci. St. Louis **14**:179. 1904, as to name only; Rydb. in N. Am. Fl. **34**¹:61. 1914.

Palafoxia Texana Hook. Ic. Pl. **2**:pl. 148. 1837, not DC. Prodr. **5**:125. 1836.

Palafoxia Hookeriana Torr. & Gray, Fl. N. Am. **2**:368. 1842, not Hooker in Curtis's Bot. Mag. **91**:t. 5549. 1864; Walp. Rep. Bot. Syst. Suppl. **1**:949. 1843.

Polypteris Hookeriana (Torr. & Gray) Gray in Proc. Am. Acad. **19**:30. 1883, in part, and Syn. Fl. N. Am. **1**²:337. 1884, and ed. 2, 1886, in part; Coulter in Contrib. U. S. Nat. Herb. **2**:230. 1892, in part; Coulter & Nelson, New Man. Bot. Cent. Rocky Mts. 555. 1909.

Polypteris maxima Small, Fl. Southeast. U. S. 1288. ed. 1, 1903, and ed. 2, 1913.

O. maximum (Small) Bush in Trans. Acad. Sci. St. Louis **14**:179. 1904.

A stout annual; stems 4–10 dm. high, usually unbranched below the inflorescence, erect, terete, densely glandular-pubescent and usually viscid throughout, furrowed; leaves petiolate, lanceolate, 6–10 cm. long, 0.8–1.4 cm. wide, acute or acuminate, narrowed at the base, roughly scabrous on both surfaces, 3-nerved, petioles about 1.5 cm. long, densely glandular; peduncles long, stout, viscid; heads few, 2.0–2.5 cm. high; involucral bracts 15–17, oblanceolate, about 1.5 cm. long, acute, densely glandular-pubescent, the outer series usually herbaceous throughout, the inner bracts with a sphacelate, reddish tip; ray-florets 8–12, the limb deeply 3-cleft, about 1.5 cm. long, the lobes rounded, the tube slender, about 7 mm. long, glandular-pubescent; disc-florets 50–60, the lobes of the corolla linear, about 4 mm. long, the tips pubescent and somewhat glandular without, the cylindraceous, glabrous throat 2 mm. long, the slender tube about 6.5 mm. long, dilated at the base and finely glandular-pubescent; achenes 7 mm. long, pubescent; pappus-scales 8, those of the ray-florets obovate, subequal, 1 mm. or less long, acute or obtuse, the margin erose, those of the disc-florets lanceolate, subequal, 7–8 mm. long, slightly exceeding the tube, acuminate, the midrib dorsally pubescent.

Distribution: southeastern Texas.

TEXAS: Sutherland Springs, Wilson Co., July 18, 1938, and Nov. 1938, *Bremer*, and July 10, 1938, *Parks*, *Bremer* & *Ammerman* (MBG); Milano, Oct. 28, 1918, *Joor* (MBG);

Industry, Aug. 1844, *Lindheimer* (MBG); without definite locality, ex. Herb. Chapman, *Lindheimer* (NYB); sand dunes, Flour Bluff, Nueces Co., Sept. 9, 1939, *Parks* (MBG).

DOUBTFUL SPECIES

Othake tenuifolium Raf. New Fl. Am. 4:74. 1836. This plant is described by Rafinesque as being similar to *O. callosum* but having very large leaves; it could not be identified with any available specimens.

POLYPTERIS

Polypteris Nutt. Gen. N. Am. Pl. 2:139. 1818, not Less. in Linnaea 6:518. 1831, nor DC. Prodr. 5:659. 1836; Ell. Sketch Bot. S. Car. & Ga. 2:313. 1824; Gray in Proc. Am. Acad. 19:30. 1883, in part, and Syn. Fl. N. Am. 1²:74, 337. 1884, and ed. 2, 1886, in part; Chapman, Fl. South. U. S., ed. 3, 261. 1897, in part; Small, Fl. Southeast. U. S. 1287. ed. 1, 1903, and ed. 2, 1913, in part; Bush in Trans. Acad. Sci. St. Louis 14:172. 1904; Gray, Manual, ed. 7, 843. 1908, in part; Coulter & Nelson, New Man. Bot. Cent. Rocky Mts. 555. 1909, in part; Rydb. in N. Am. Fl. 34¹:61. 1914; Small, Man. Southeast. Fl. 1462. 1933, in part.

Paleolaria Cass. in Bull. Soc. Phil. 198. 1816, in part; Less. Syn. Comp. 155. 1832, in part.

Palafoxia DC. Prodr. 5:124. 1836, in part, not Lag. Gen. et Sp. Nov. 26. 1816, in part; Benth. & Hook. Gen. Pl. 2:405. 1873.

Lomaxeta Raf. New Fl. Am. 4:72. 1836.

Herbaceous, caulescent perennials with long, slender, fibrous roots. Stems several from a common base, strigillose, eglandular. Leaves alternate or the lower opposite, entire, thick, 1-3-nerved. Heads discoid, in a terminal, corymbiform cluster. Involucre turbinate, the bracts 2-3-seriate, membranaceous, not enfolding the marginal achenes, several of the outer series short and spreading or reflexed. Receptacle flat, naked, pitted, the surface uneven because of irregular aggregations of tissue around the base of the achenes. Corollas regular, deeply 5-lobed, the campanulate throat shorter than the spreading lobes or the slender tube. Stamen-tube completely exserted, the anthers obtuse or rounded at the base. Style-branches linear, obtuse or somewhat acute, exserted from the stamen-tube, spreading or recurved, hispidulous. Achenes 4-5-angled, obpyramidal, pubescent. Pappus of about 10 scarious, subequal scales with a midrib extending to the tip, the squamellae of the marginal achenes not reduced.

Type species: *Polypteris integrifolia* Nutt. Gen. N. Am. Pl. 2:139. 1818.

1. *Polypteris integrifolia* Nutt. Gen. N. Am. Pl. 2:139. 1818, not DC. Prodr. 5:659. 1836; Ell. Sketch Bot. S. Car. & Ga. 2:314. 1824; Chapman, West. Jour. Med. & Surg. 471. 1845; Gray, Syn. Fl. N. Am. 1²:337. 1884, and ed. 2, 1886; Chapman, Fl. South. U. S. ed. 3, 261. 1897; Small, Fl. Southeast.

U. S., ed. 1, 1287. 1903, and ed. 2, 1913; Rydb. in N. Am. Fl. 34¹:62. 1914; Small, Man. Southeast. Fl. 1462. 1933.

Hymenopappus integrifolius Spreng. Syst. 3:449. 1826.

Paleolaria fastigiata Less. Syn. Comp. 156. 1832.

Palafoxia fastigiata DC. Prodr. 5:125. 1836; Dietrich, Syn. Pl. 1345. 1847.

Lomaxeta verrucosa Raf. New Fl. Am. 4:72. 1836.

Palafoxia integrifolia Torr. & Gray, Fl. N. Am. 2:368. 1842; Walp. Rep. Bot. Syst. Suppl. 1:949. 1843; Benth. & Hook. Gen. Pl. 2:405. 1873; Hoffm. in Engler & Prantl, Die Nat. Pflanzenfam. IV, Abt. 5, p. 261. 1891.

An herbaceous perennial, woody at the base; stem 9–12 dm. high, sparingly branched below the inflorescence, erect, terete, strigillose throughout or nearly glabrous below, furrowed, brown; leaves petiolate, linear to oblong-lanceolate, 3–8 cm. long, 0.2–1.0 cm. wide, obtuse to somewhat acute, narrowed at the base, scabrous on both surfaces, dark green, the tuberculate hair-bases often white and conspicuous, petioles 3–8 mm. long; peduncles slender or slightly enlarged below the heads, strigose; heads numerous, 1.5–2.0 cm. long; involucral bracts about 15, oblong to oblong-spatulate, usually about 9 mm. long, membranaceous, truncate, rounded or obtuse, somewhat erose at the apex, flat, thin, finely scabrous or glabrous, stramineous, the short, reflexed, outer bracts 2.5 mm. long and somewhat herbaceous; florets 17–20 in a head, white or flesh-colored; corolla-lobes linear, 4 mm. long, acutish, the tips thickened and pubescent without; throat campanulate, 2 mm. long, glabrous; tube very slender, abruptly dilated at the base, 6 mm. long, pubescent; style-branches exerted about half their length from the stamen-tube; achenes 5–6 mm. long, puberulent; pappus-scales 9–11, lanceolate, subequal, 5–7 mm. long, exceeding the corolla-tube, acuminate, the hyaline margin erose or somewhat lacerate, the callose midrib dorsally pubescent.

Distribution: southern Georgia and Florida.

GEORGIA: without definite locality, *Baldwin* (ANSP), TYPE.

FLORIDA: Quincy, *Chapman* (ANSP); dry pine-barrens, near Apalachicola, Oct. 15, 1890, *ex Herb. Chapman 791a* (MBG); dry pine-barrens, Aspalaga, Oct. 1897, *ex Herb. Chapman 791b* (MBG); dry pine-barrens, near Jacksonville, Oct., *Curtiss 1507* (ANSP, MBG); near Jacksonville, Oct. 11, 1893, *Curtiss 4494* (MBG); pine-barrens, Indian River region, Brevard Co., Nov. 28, 1902, *Fredholm 5623* (MBG); Tampa, Oct. 1877, *Garber* (ANSP); in the vicinity of Eustis, June and July, 1894, *Hitchcock* (MBG); Miami, March, 1917, *Meredith* (ANSP); high pine-land, in the vicinity of Eustis, Lake Co., July 1–15, 1894, *Nash 1191* (MBG); dry pine woods, Polk Co., May 20, 1894, *Oblinger 349* (MBG); dry pine-lands, St. Leo, King Lake, Oct. 10, 1926, *O'Neill 1922* (MBG); Biscayne Bay, 1874, *Palmer* (MBG); Palatka, Dec. 5, 1871, *ex Herb. Porter* (ANSP); Miami, *Small & Carter* (ANSP); between Coconut Grove and Cutler, Dade Co., Nov. 1903, *Small & Carter 1231* (ANSP); Eustis, Oct. 8, 1896, *Webber 532* (MBG); St. Petersburg, Aug. 1894, *Williamson* (ANSP).

EXCLUDED SPECIES

Polypteris brasiliensis Less. in Linnaea 6:518. 1831 (= *Gaillardia lanceolata* Michx).

PALAFOXIA

Palafoxia Lag. Elench. Pl. Hort. Matr. 26. 1816, and Gen. et Sp. Nov. 26. 1816; Spreng. Syst. 3:449. 1826; DC. Prodr. 5:124. 1836, in part; Benth. & Hook. Gen. Pl. 2:405. 1873, in part; Gray, Geol. Surv. Calif. Bot. 1:387. 1876, in part, and in Proc. Am. Acad. Sci. 19:30. 1883; Baillon, Hist. des Plantes 8:249. 1886, in part; Gray, Syn. Fl. N. Am. 1²:74, 338. 1884, and ed. 2, 1886; Hoffm. in Engl. & Prantl, Die Nat. Pflanzenfam. IV, Abt. 5, p. 261. 1891, in part; Small, Fl. Southeast. U. S. 1288. 1903, and ed. 2, 1913; Jepson, Man. Fl. Pl. Calif. 1127. 1925; Small, Man. Southeast. Fl. 1463. 1933; Munz, Man. South. Calif. Bot. 563. 1935.

Paleolaria Cass. in Bull. Soc. Phil. 198. 1816, and in Dict. Sci. Nat. 1, Suppl. 59. 1816, and 38:256. 1825.

Herbaceous, branching annuals, often becoming woody below and perennial. Stem usually one from a tap-root, strigose to hispid, eglandular to densely glandular-pubescent. Leaves alternate or the lower opposite, entire, thick, 1-3-nerved. Heads discoid, in cymose or corymbiform clusters terminating the branches. Involucre oblong or turbinate, the bracts in 2-3 series, subequal, entirely herbaceous, rarely membranaceous. Receptacle flat, naked, foveolate. Corollas regular, 5-lobed, the cylindraceous throat much longer than the corolla-lobes and short tube. Stamen-tube partly exerted from the throat, the anthers obtuse or rounded at the base. Style-branches filiform, spreading or recurved, hispidulous. Achenes quadrangular, linear to obpyramidal, pubescent. Pappus-scales several to 10, unequal, hyaline and scarious with a stout callose midrib, the scales of the marginal achenes often reduced.

Type species: **Palafoxia linearis** Lag. Elench. Pl. Hort. Matr. 26. 1816.

KEY TO THE SUBGENERA

- A. Involucral bracts entirely herbaceous, green, somewhat keeled, closely enfolding the mature marginal achenes; pappus-scales longer than the corolla-tube..... EUPALAFOXIA. Sp. 1
- AA. Involucral bracts membranaceous, purplish, flat, not enfolding the outer achenes; pappus-scales shorter than the corolla-tube..... PSEUDOPALAFOXIA. Sp. 2

KEY TO THE SPECIES AND VARIETIES

- A. Involucral bracts herbaceous; pappus-scales longer than the corolla-tube.
 - B. Pappus-scales of the inner florets of the head acerose, equalling or exceeding the throat; plants erect.
 - C. Peduncles glandular-pubescent; leaves 2-6 mm. broad; florets about 15 in a head..... 1. *P. LINEARIS*
 - CC. Peduncles almost eglandular; leaves 8-11 mm. broad; florets about 25 in a head..... 1a. *P. LINEARIS* var. *GIGANTEA*
 - BB. Pappus-scales of the inner florets of the head obtuse or emarginate, shorter than the throat; plants somewhat decumbent..... 1b. *P. LINEARIS* var. *LEUCOPHYLLA*
- AA. Involucral bracts membranaceous; pappus-scales shorter than the corolla-tube..... 2. *P. FEAYI*

1. *Palafoxia linearis* (Cav.) Lag. Elench. Pl. Hort. Matr. 26. 1816, and Gen. et. Sp. Nov. 26. 1816; Hook. in Curtis's Bot. Mag. 47:t. 2132. 1820; Spreng. Syst. Veg. 3:449. 1826; DC. Prodr. 5:124. 1836; Dietrich, Syn. Pl. 1345. 1847; Gray, Geol. Surv. Calif. Bot. 1:338. 1876, and Syn. Fl. N. Am. 1²:338. 1884, and ed. 2, 1886; Rydb. in N. Am. Fl. 34¹:62. 1914; Jepson, Man. Fl. Pl. Calif. 1127, fig. 992. 1925; Tidestrom in Contrib. U. S. Nat. Herb. 25:591. 1925; Munz, Man. South. Calif. Bot. 563. 1935.

Ageratum lineare Cav. Ic. 3:3, t. 205. 1794.

Stevia linearis Cav. Praelect. n. 464, and Ic. 4:32. 1797; Willd. Sp. Pl. 1774. 1804.

Stevia lavendulaefolia Schlecht. in Suppl. to Willd. Enum. Pl. 57. 1813; DC. Prodr. 5:125. 1836, in synonymy.

Paleolaria carnea Cass. in Bull. Soc. Phil. 47. 1818, and in Dict. Sci. Nat. 38:256. 1825; Less. Syn. Comp. 155. 1832.

An herbaceous annual, occasionally suffruticose and perennial; stem 1–7 dm. high, divaricately branched throughout, ascending, terete, furrowed, scabrous to roughly hispid, the upper parts glandular; leaves petiolate, linear to linear-lanceolate, 4–6 cm. long, 2–6 mm. wide, obtuse, entire, attenuated at the base, canescent-scabrous on both sides, thick, 1-nerved, often indistinctly 3-nerved, petioles 0.3–1.0 cm. long; peduncles long, slightly scabrous, densely glandular; heads in cymose or corymbiform clusters, 2–3 cm. high; involucre oblong to obconic, the bracts 7–13, linear-oblong, 1.0–1.5 cm. long, herbaceous throughout or those of the inner series with hyaline margins, acute to obtuse, scabrous, finely glandular, somewhat keeled, slightly saccate at the base, closely enfolding the marginal achenes; florets 10–18 in a head; corolla-lobes 1.5 mm. long, obtuse, the tips pubescent without; throat cylindraceous, about 5 mm. long, glabrous; tube slender, 2.5–3.5 mm. long, scarcely dilated at the base, glabrous to glandular-pubescent; achenes 1.0–1.5 cm. long, linear, attenuated downward; pappus-scales 3–8, unequal, the inner florets having either 4 long scales exceeding the throat, 0.7–1.0 cm. long, lanceolate, with a stiff, acerose midrib, alternating with 4 small, obtuse scales with included ribs, or 8 unequal scales, the marginal florets having 3–8 scales like those of the inner achenes or reduced to minute callosities with narrow, hyaline margins.

Distribution: Arizona to southern California.

ARIZONA: Yuma, Beard 1911 (MBG); 20 mi. above Pierce's Ferry, April 19, 1894, Jones 5081 (MBG); 11 mi. e. of Gila Bend, April 10, 1932, Jones 29466 (MBG); sand desert on Ariz.-Nev. line, along U. S. Highway 91, Mohave-Clark Counties, April 4, 1934, Maguire, Maguire & Maguire 5067 (MBG); in the Fortuna Range, Yuma, Feb. 26, 1930, Nelson 11143a (MBG); Williams Fork of the Colorado River, March 11, 1876, Palmer 10253 (MBG).

NEVADA: sandy, stony washes, Virgin River, May 5, 1902, Goodding 709 (MBG); desert 1 mi. w. of Riverside, Clark Co., May 19, 1933, Maguire & Blood 4505 (MBG).

CALIFORNIA: old beach, Colorado Desert, San Diego Co., March 24, 1903, Abrams 3147 (MBG); near Yaqui Wells, Colorado Desert, San Diego Co., April 12, 1913, East-

wood 2676 (MBG); White Water Desert, Nov. 11, 1890, *Engelmann* (MBG); Palm Springs, March, 1927, *Epling* (MBG); alluvial fan, Opher mine, Mohave Desert, Slate Mts., April 18, 1930, *Epling, Ellison & Anderson* (MBG); sand flat, Thousand Palms Canyon, Coachella Valley, Riverside Co., March 13, 1932, *Fosberg* 8093 (MBG); wash, w. end of Sheep Hole Mts., San Bernardino Co., April 24, 1932, *Fosberg* 8172 (MBG); western borders of the Colorado Desert, Coyote Canyon, Lower Sonoran Zone, April, 1902, *Hall* 2768 (MBG); Palm Springs, Apr. 1926, *Haupt* (MBG); sandy wash, Deep Canyon, Coachella Valley, Riverside Co., March 14, 1932, *Munz* 11075 (MBG); sandy wash, 5 mi. n. w. of Dixieland, Imperial Co., April 4, 1932, *Munz & Hitchcock* 12109 (MBG); Indian Springs, Colorado Desert, June 24, 1888, *Orcutt* 1500 (MBG); s. w. part of the Colorado Desert, San Diego Co., Nov. 1889, *Orcutt* (MBG); Carris Creek, Colorado Desert, April 25, 1890, *ex Orcutt Herb.* 2241 (MBG); Indio, Colorado Desert, April 24, 1891, *ex Orcutt Herb.* (MBG); Whitewater, Riverside Co., March, 1882, *Parish* 4, and June 14, 1894, 3109 (MBG); Palm Springs, desert base of San Jacinto Mt., April 4-13, 1896, *Parish* 4121 (MBG); desert wash, 15 mi. w. of Indio, L. A. Aqueduct Rd., Colorado Desert, Riverside Co., Jan. 1, 1936, *Rose* 36003 (MBG).

1a. *Palafoxia linearis* var. *gigantea* Jones, Extracts from Contrib. West. Bot. 18:79. 1933; *Munz, Man. South. Calif. Bot.* 563, fig. 299. 1935.

Palafoxia linearis var. *arenicola* Nelson in Am. Jour. Bot. 23:265. 1936.

Stem erect, annual or perennial, 7-10 dm. high, glabrous or nearly so; leaves 6-8 cm. long, 8-11 mm. broad, distinctly 3-nerved; peduncles strigose and almost eglandular; heads large, 2.5-3.0 cm. high; involucral bracts about 24, strigose, eglandular; florets 25 or more; achenes about 1.5 cm. long; pappus-scales 8, unequal, 0.5-1.0 cm. long, the four long, acerose scales equalling or exceeding the throat, the four alternate scales very short, usually obtuse, with included midrib; in other characters as the species.

Distribution: California, in sand dunes west of Yuma, Arizona.

CALIFORNIA: w. of Yuma, Ariz., Sept. 24, *Jones* 28599 TYPE, and Feb. 27, 1930, *Nelson* 11161 (MBG); common in dunes e. of Holtville, Imperial Co., April 5, 1932, *Munz & Hitchcock* 12131 (MBG).

1b. *Palafoxia linearis* var. *leucophylla* Johnston in Proc. Calif. Acad. Sci. IV. 12:1202. 1924

P. leucophylla Gray in Proc. Am. Acad. 8:291. 1870, and Geol. Surv. Calif. Bot. 1:388. 1876; Rydb. in N. Am. Fl. 34¹:63. 1914.

P. linearis Gray in Proc. Am. Acad. 19:31. 1883, not Lag. Gen. et Sp. Nov. 26. 1816.

P. arenaria Brandeg. in Proc. Calif. Acad. Sci. II. 2:178. 1889; Goldman in Contrib. U. S. Nat. Herb. 16:369. 1916.

A shrubby, somewhat decumbent, much-branched perennial; stem 4-10 dm. high, densely glandular-hispid and scabrous in the upper parts or throughout; heads 1.5-2.0 cm. long; pappus-scales about 8, unequal, not exceeding the throat, often no more than half the length of the throat, obtuse or emarginate, sometimes acute; in other characters as the species.

Distribution: Mexico, chiefly Baja California.

MEXICO:

COAHUILA: Torreon, Oct. 13-20, 1898, *Palmer 486* (MBG).

BAJA CALIFORNIA: sand dunes, San Nicholas Bay, May 16, 1921, *Johnston 3716* (MBG); sand dunes, Loreto, May 20, 1921, *Johnston 3776* (MBG); La Paz, Feb. 7, 1928, *Jones 24065* (MBG).

2. *Palafoxia Feayi* Gray in Proc. Am. Acad. 12:59. 1877; Chapman in Bot. Gaz. 3:6. 1878; Gray, Syn. Fl. N. Am. 1²:338. 1884, and ed. 2, 1886; Chapman, Fl. South. U. S., ed. 3, 261. 1897; Small, Fl. Southeast. U. S. 1288. 1903, and ed. 2, 1913; Rydb. in N. Am. Fl. 34¹:63. 1914; Small, Man. Southeast. Fl. 1463. 1933.

An herbaceous perennial, woody at the base; stem 4-10 dm. high, simple or branched, erect, terete, strigillose, furrowed; leaves petiolate, lanceolate-oblong to oblong-elliptic, 2.5-5.5 cm. long, 0.5-2.5 cm. broad, usually obtuse, slightly callose at the tip, rounded at the base, rather scabrous, the hair-bases often white and conspicuous, distinctly 3-nerved, petioles 2-6 mm. long; peduncles long and slender, strigillose, eglandular; heads numerous, in corymbiform clusters, 1.5-2.0 cm. high; involucre turbinate, the bracts 9-11, linear to oblong, 5-8 mm. long, membranaceous, thickened along the midvein, truncate or obtuse, often strigillose, purple-tipped or purplish throughout, several of the outer series shorter and reflexed, 2-4 mm. long; florets about 18 in a head; corolla-lobes 1.5-2.5 mm. long, obtuse, the tips thickened and pubescent without; throat cylindraceous, 4-5 mm. long, glabrous; achenes 6-8 mm. long, obpyramidal, sparingly pubescent; pappus-scales 8-10, usually obovate, subequal, 0.5-3.0 mm. long, obtuse, the scarious margin erose, the midrib dorsally pubescent and extending about two-thirds the length of the scale.

This species is intermediate between the genera *Polypteris* and *Palafoxia*, but it is placed in the latter group because of the floret characters. The nature of the involucre and the general habit of the plant, however, suggest a close alliance with *Polypteris*.

Distribution: Florida.

FLORIDA: Clear Water Harbor to Caxambas, *Chapman* (G); without definite locality, *Curtiss 102* (G); sandy soil, Indian River, Sept., *Curtiss 1507* (G); dry scrub near Seville, Volusia Co., July 17, 1900, *Curtiss 6688* (G, MBG); s. Florida, comm., Jan. 7, 1876, *Feay* (G), TYPE; dry pine-barrens, Indian River region, Brevard Co., Oct. 29, 1902, *Fredholm 5528a* (G); Caxambas Bay, Sept. 1878, *Garber 11870* (MBG); flat woods, Marco, Lee Co., July & Aug., 1900, *Hitchcock 139* (G, MBG); scrub land, Wekiwe Springs, Sept. 16, 1929, *O'Neill 5601* (MBG); dry, sandy soil, open scrub land, Kelsey City, Palm Beach Co., Nov. 25, 1920, *Randolph 157* (G); without definite locality, 1842-1849, *Rugel 60* (MBG); pine-lands about Arch Creek Prairie, Dade Co., July 3, 1915, *Small, Mosier & Small 6811* (G); Manatee, Sept. 12, 1899, *Tracy 6357* (MBG); Palma Sola, April 30, 1900, *Tracy 6932* (MBG).

LIST OF EXSICCATAE

The distribution numbers are indicated by *italics*, or, when the specimen is not numbered, by a dash. The numbers in parenthesis refer to the species in this study.

OTHAKE

- Ammerman, Elizabeth. 7 (2); 8, 39 (1); 97 (3).
 Baker, Carl F. — (6).
 Barkley, Fred A. 1499 (3).
 Berlandier, Jean. 604, 2041 (3).
 Bremer, E. — (6).
 Bush, Benjamin F. 115, 204, 476, 1146 (1); 1599 (2); 3187, 3354, 4983, 14999, 15180, 15195, 15752, 15756, 15942 (1).
 Carleton, M. A. — (6).
 Clemens, Mrs. Joseph. — (6).
 Cory, V. L. 25366 (1); 26155 (5).
 Cutak, Ladislaus. — (6).
 Duncan, Mrs. F. T. 29 (6).
 Earle, F. S. & E. S. Earle. 381 (6).
 Eggert, Henry. — (1); — (2); — (6).
 Eggleston, W. W. 16193 (6).
 Emig, W. H. 43 (1).
 Eskew, C. T. 1502 (1); 1524 (6).
 Ferris, Roxana S. & Carl D. Duncan. 2915 (1); 3014 (3); 3365 (6); 3375 (3); 3411, 3501 (6).
 Galeotti, H. 2627 (4).
 Glatfelter, N. M. — (2).
 Goodman, George Jones. 2175, 2354 (6).
 Greenman, Jesse More. 95 (4).
 Griffiths, David. 6320 (3).
 Hall, Elihu. 356 (1).
 Hapeman, H. — (6).
 Heller, A. Arthur. 1562 (2a).
 Hitchcock, Albert S. 288 (6).
 James, E. P. — (6).
 ex Jermy Herb. 804 (1).
 Jones, Marcus E. 26398, 29467 (3).
 Joor, J. F. — (2); — (5); — (7).
 Kenoyer, Leslie A. — (3); 728 (2a).
 Letterman, George W. — (1); — (6).
 Linden, Jean-Jules. — (4).
 Lindheimer, Ferdinand. — (2); — (7); 955, 956 (1).
 Mackenzie, Kenneth K. — (1); 7 (3).
 Nelson, Aven. 11680 (6).
 Nuttall, Thomas. — (1).
 Orcutt, Charles Russell. 5548 (3).
 Osterhout, George E. 4097, 4314 (3a).
 Ownbey, Francis Marion. 1051 (3a).
 Palmer, Ernest J. 38 (2a); 4078, 4492, 4633, 4893, 6443a (1); 8575, 10732 (2); 10782 (3); 10898 (1); 12543 (6); 12856 (1); 14100 (6); 19067, 29531 (1); 31756 (5); 33012 (1); 41895 (6).
 Pammel, L. H. — (2).

- Parks, H. B. — (1); — (2a); — (7).
 Parks, H. B. & E. Ammerman. 62 (3).
 Parks, H. B., E. Bremer & E. Ammerman. — (7).
 Parks, H. B. & V. L. Cory. —, 12290, 12401 (3); 16941, 16942 (2a); 16946 (3); 20747, 20748 (1).
 Pringle, Cyrus Guernsey. 2655 (3); 6354 (2a).
 Purpus, C. A. 6025 (4).
 Reverchon, Jules. — (1); 1230 (2a); 2577 (2); 3219 (6); 3288 (1); 3289 (5); 3290 (2); 3655 (1); 3656 (2).
 Runyon, Robert. 209 (2a).
 Shepard, E. M. — (1).
 Smyth, H. B. 783 (6).
 Stevens, G. W. 2908 (6).
 Steyermark, Julian A. 14657 (1).
 Stratton, Robert A. 411 (6).
 Thompson, Charles H. 76 (6).
 Tracy, S. M. 8142 (1); 8163 (6).
 Trelease, William. — (2); 66 (3).
 Warner, Selden R. — (2).
 White, Mark. 250 (6).
 White, Paul. — (6).
 Wislizenus, Frederick W. — (1).
 Wooton, E. O. —, 28 (6).
 Wynd, F. Lyle & C. H. Mueller. 83, 120 (3).

POLYPTERIS

- Baldwyn. — (1).
 Chapman, A. W. — (1).
 ex Chapman Herb. 791a, 791b (1).
 Curtiss, A. H. 1507, 4494 (1).
 Fredholm, A. 5623 (1).
 Garber, A. P. — (1).
 Hitchcock, Albert S. — (1).
 Meredith, D. W. — (1).
 Nash, George Valentine. 1191 (1).
 Ohlinger, L. B. 340 (1).
 O'Neill, Hugh. 1922 (1).
 Palmer, Edward J. — (1).
 ex Porter Herb. — (1).
 Small, John Kunkel & J. J. Carter. —, 1231 (1).
 Webber, H. J. 532 (1).
 Williamson, C. S. — (1).

PALAFOXIA

- Abrams, LeRoy. 3147 (1).
 Beard, A. 1911 (1).
 Chapman, A. W. — (2).
 Curtiss, A. H. 102, 1507, 6688 (2).
 Eastwood, Alice. 2676 (1).
 Engelmann, George. — (1).
 Epling, Carl C. — (1).

Epling, Carl, Lincoln Ellison, & Harvey Anderson. — (1).
Feay, W. (2).
Fosberg, F. R. 8093, 8172 (1).
Fredholm, A. 5528a (2).
Garber, A. P. 11870 (2).
Goodding, Leslie N. 709 (1).
Hall, H. M. 2768 (1).
Haupt, A. W. — (1).
Hitchcock, Albert S. —, 139 (2).
Johnston, Ivan M. 3716, 3776 (1b).
Jones, Marcus E. 5081 (1); 24065 (1b), 28599 (1a); 29466 (1).
Maguire, Bassett & H. L. Blood. 4505 (1).
Maguire, Bassett, Ruth Maguire, & C. B. Maguire. 5067 (1).
Munz, Philip A. 11975 (1).
Munz, Philip A. & Charles Leo Hitchcock. 12109 (1); 12131 (1a).
Nelson, Aven. 11143a (1); 11161 (1a).
O'Neill, Hugh. 5601 (2).
Orcutt, Charles Russell. —, 1500 (1).
ex Orcutt Herb. —, 2241 (1).
Palmer, Ernest J. 468 (1b); 10253 (1).
Parish, Samuel B. 4, 3109, 4121 (1).
Randolph, Fannie R. 157 (2).
Rose, Lewis S. 36003 (1).
Rugel, F. 60 (2).
Small, John Kunkel, S. A. Mosier, & Gertrude K. Small. 6811 (2).
Tracy, S. M. 6357, 6932 (2).

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EXPLANATION OF PLATE

PLATE 10

Othake callosum

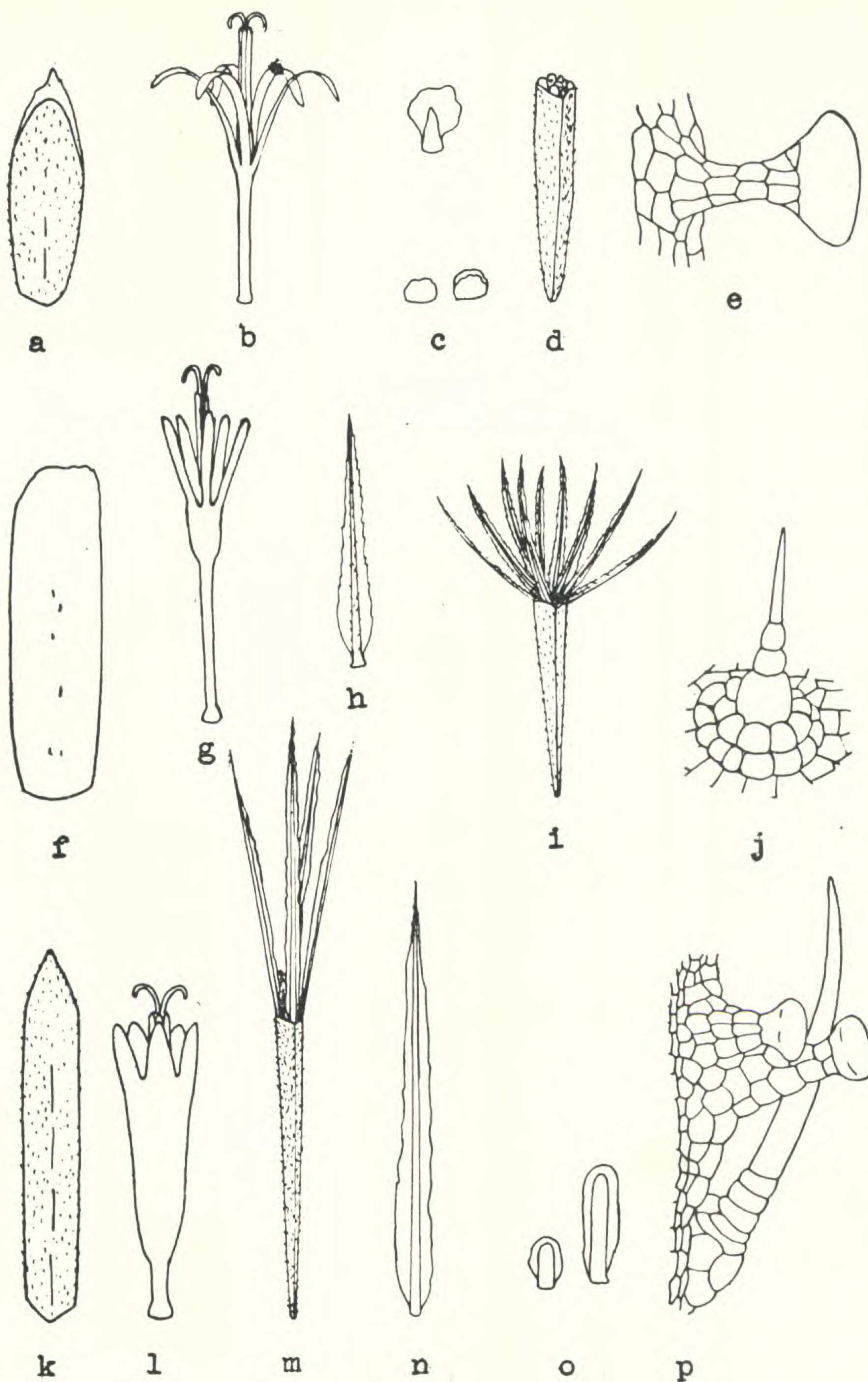
- a. involucral bract (x 5.7)
- b. corolla (x 5.7)
- c. pappus-scales (x 5.7)
- d. achene (x 9.5)
- e. glandular hair on peduncle, greatly magnified

Polypteris integrifolia

- f. involucral bract (x 4.75)
- g. corolla (x 2.8)
- h. pappus-scale (x 5.7)
- i. achene (x 4.75)
- j. tuberculate hair on leaf, greatly magnified

Palafoxia linearis

- k. involucral bract (x 4.75)
- l. corolla (x 5.7)
- m. achene (x 3.8)
- n. pappus-scale (x 5.7)
- o. pappus-scales of marginal achenes (x 7.6)
- p. hairs on peduncle, greatly magnified

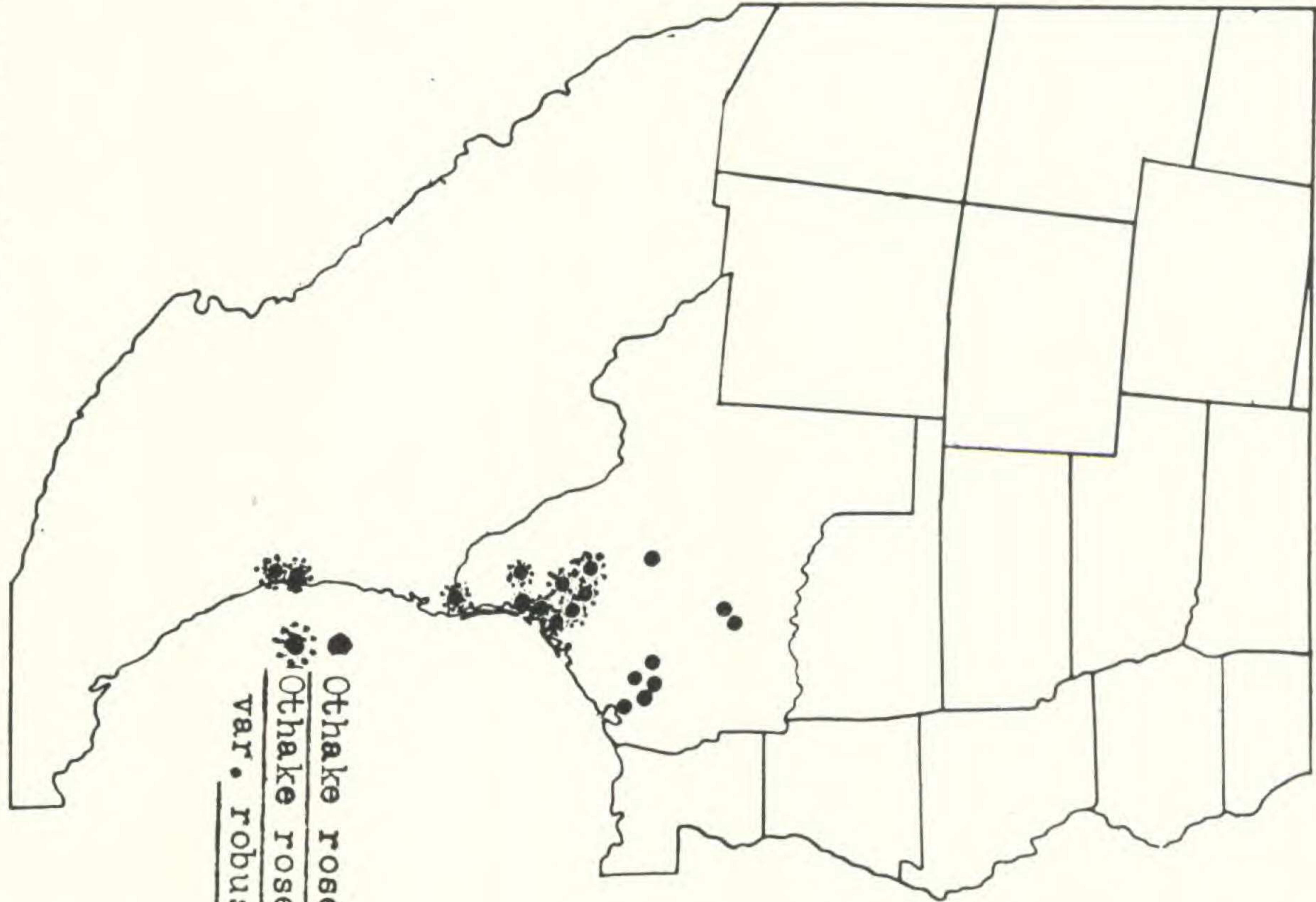
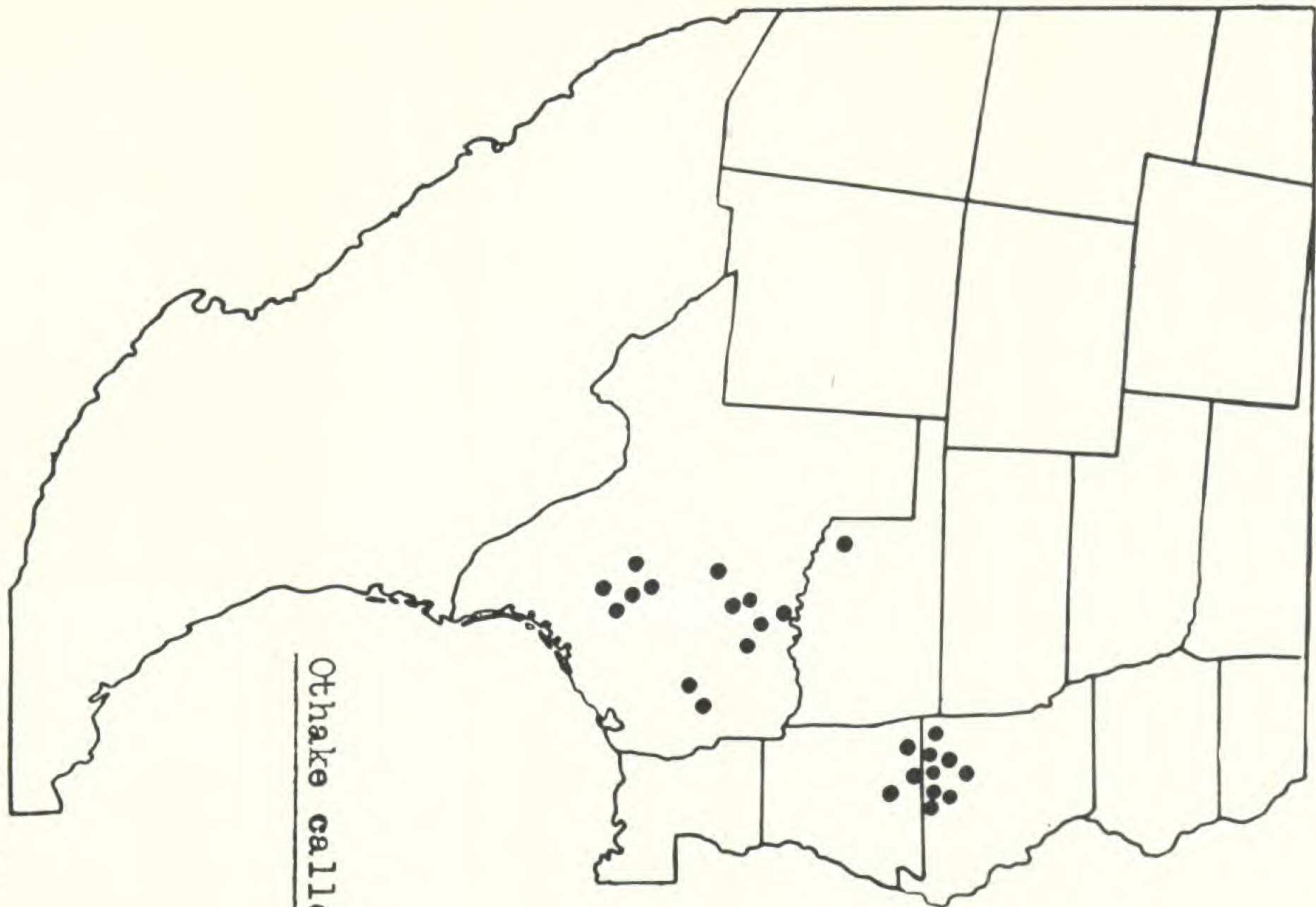


AMMERMAN—PALAFOXIA AND ALLIES

EXPLANATION OF PLATE

PLATE 11

Distribution of *Othake callosum*, *O. roseum*, and *O. roseum* var. *robustum* as indicated by specimens in the Herbarium of the Missouri Botanical Garden.

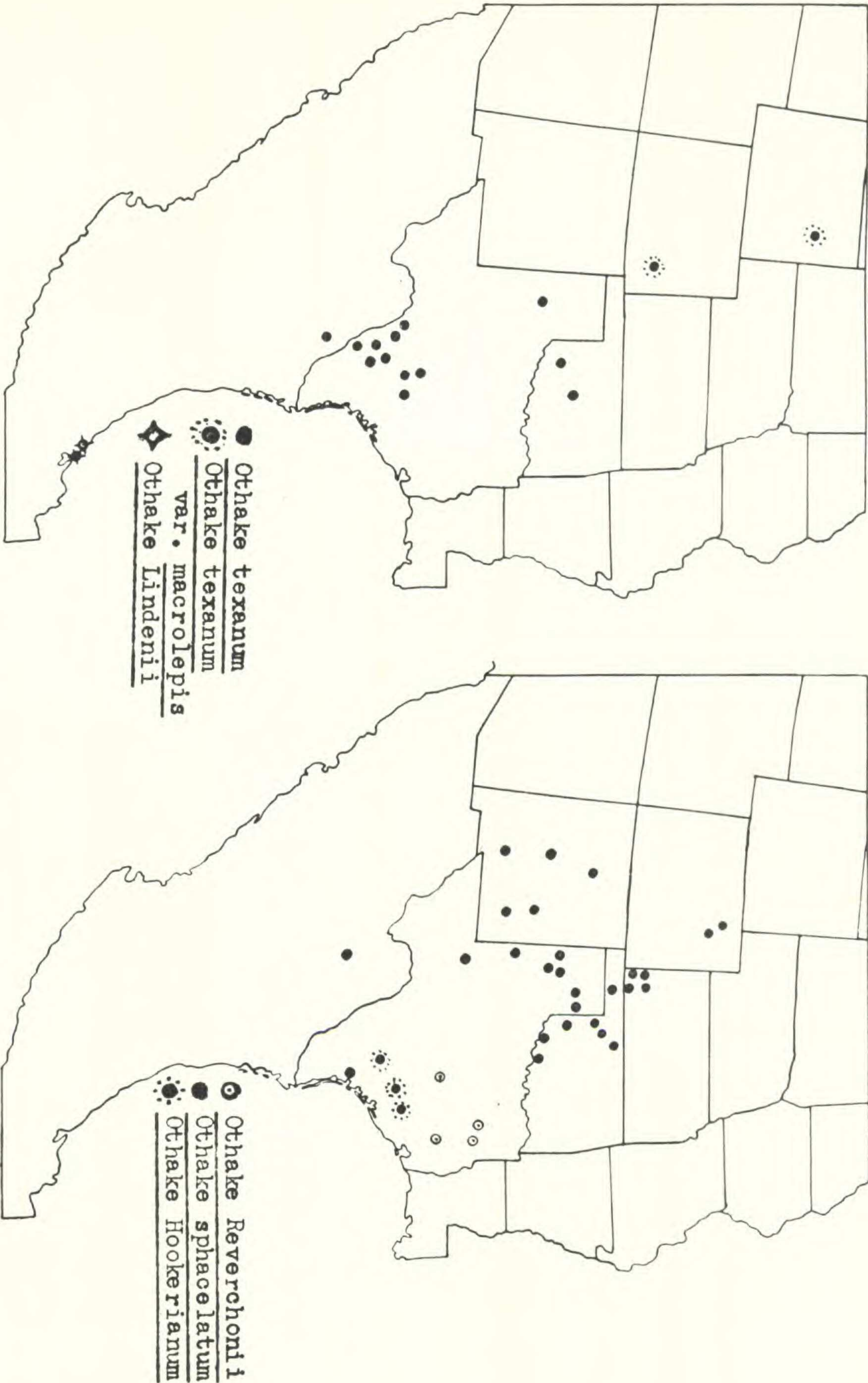


AMMERMAN—PALAFOXIA AND ALLIES

EXPLANATION OF PLATE

PLATE 12

Distribution of *Othake texanum*, *O. texanum* var. *macrolepis*, *O. Lindenii*, *O. Reverchonii*, *O. sphacelatum*, and *O. Hookerianum*, as indicated by specimens in the Herbarium of the Missouri Botanical Garden.



AMMERMAN—PALAFOXIA AND ALLIES

EXPLANATION OF PLATE

PLATE 13

Distribution of *Palafoxia linearis*, *P. linearis* var. *gigantea*, *P. linearis* var. *leucophylla*, *Polypteris integrifolia*, and *Palafoxia Feayi*, as indicated by specimens in the Herbarium of the Missouri Botanical Garden.

